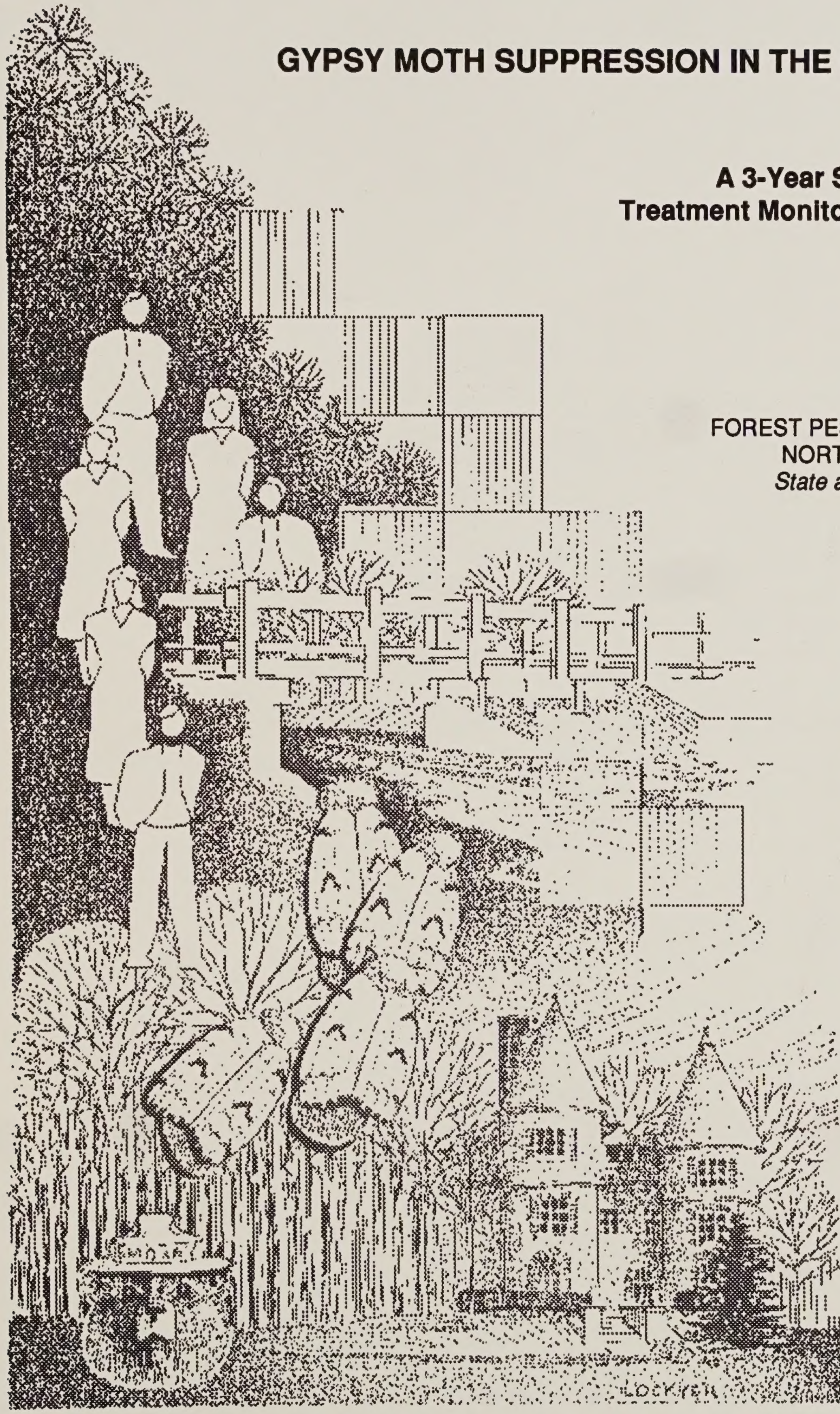
GYPSY MOTH SUPPRESSION IN THE NORTHEAST

A 3-Year Summary of the Treatment Monitoring Data Base



FOREST PEST MANAGEMENT
NORTHEASTERN AREA
State and Private Forestry

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Morgantown, WV
July 1990
NA-TP-18

United States
Department of
Agriculture
Forest Service

Acknowledgements

The authors wish to acknowledge the efforts of the following agencies in their support of the Treatment Monitoring Data Base.

Delaware Department of Agriculture
New Jersey Department of Agriculture
New Jersey Bureau of Forestry
Pennsylvania Bureau of Forestry
Virginia Department of Agriculture
Maryland Department of Agriculture
Michigan Department of Agriculture
West Virginia Department of Agriculture
Allegheny National Forest

In addition, Peter Rush, John Ghent and Robert Wolfe, USDA Forest Service, reviewed the manuscript. Chuck Coole, USDA Forest Service, Morgantown, WV, produced the document.

Foreword

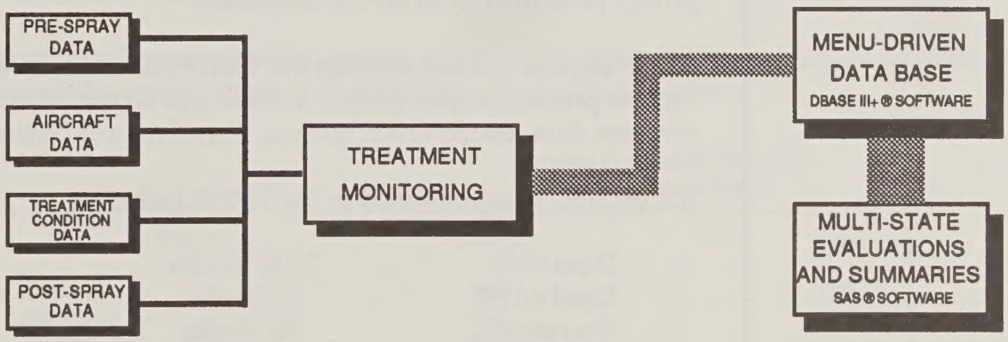
In a gypsy moth spray project, it's not that we relish the spraying, but that we wish to be rid of the gypsy moth. So how are we doing?

INTRODUCTION

The Treatment Monitoring Data Base (TMDB) was implemented in 1986 in response to an identified gap in knowledge about gypsy moth suppression effectiveness or parameters associated with effectiveness. The TMDB was developed to 1) provide information about the results of operational projects, and 2) at the same time provide information about conditions leading up to those results. In 1985, when the TMDB was being designed, no record of project results or operations existed and program improvement was mired in speculation. More importantly, the effectiveness of USDA cooperative suppression programs was not documented. Effectiveness, at that point in time, had not been defined. TMDB offers a way to define and quantify project effectiveness and also evaluate operations. This is done with minimal impact upon project logistics. The TMDB focuses upon project effectiveness—that is, how are we doing?

A part of the usefulness of TMDB lies in its record-keeping and data summary aspects. Aerial application projects are very complex, requiring attention to numerous variables. The TMDB provides a way to track variables that may be related to project results or are needed to summarize project operations.

The TMDB contains data collected from treatment blocks. The TMDB consists of three main components; data collection, a data base, and summaries of the data.



Data includes information about the site or block, about the treatment and conditions during treatment, about the aircraft performing the treatment, and results after treatment. At present, the TMDB contains data spanning 4 years and over 2,000 blocks in 8 States and one National Forest. The TMDB is particularly suited to large projects with numerous treatment blocks where record-keeping and data analysis are difficult. The TMDB is also useful in helping to focus attention upon aspects of aerial application that are important in achieving success. In this aspect, it is also a training tool.

This report represents the first organized attempt to evaluate gypsy moth operations and evaluate effectiveness both within and among projects. It summarizes 3 years of the TMDB, 1986-1988, except for West Virginia which includes 1987-1989.

METHODS

Data is collected as a survey. The TMDB provides a data collection format for each project as shown in Appendix 1. This is the same data used in conjunction with the operational aspects of each project. The TMDB does not have experimental design other than as a broadly-based survey. In the TMDB, a project consists of numerous treatment blocks.

The primary survey unit in this analysis is the treatment block, a variable size area designated by State or Forest Service personnel as an area to be sprayed. Treatment blocks included in the data base are selected by each project. In some projects, all or nearly all treatment blocks are represented in the TMDB while in other projects only a fraction of the total number of blocks treated are represented. The amount of data collected from each treatment block also varies depending upon the personnel constraints of each project. Some projects collected all data except post-treatment data.

All data is verified with the submitting project. At all times "unknown" is a possible data entry to avoid guessing or lack of data.

Egg mass survey estimates reported here are based both upon 1/40th-acre fixed size plots and timed walks. The number of walks or plots used to estimate egg mass density varies among projects and is known, but not reported here. Timed walk estimates were used in Delaware, Michigan, New Jersey Forestry, and West Virginia. Statistics associated with egg mass density estimates were not calculated.

Information about larval instar development, foliage development, and levels of defoliation are also provided by observations made from within each treatment block. Meterological data, such as windspeeds, temperatures, and relative humidities are obtained by project personnel from on-site estimates.

All of the data collected within the TMDB has not been summarized here. This report focuses primarily upon project success and factors related to success. The TMDB contains data related to aircraft use. This data will be summarized in a later report.

B.t. product data contained in the TMDB includes:

Dipel 8L®	2,249 blocks
Dipel 8AF®	59 blocks
Thuricide®	56 blocks
SAN 415®	56 blocks

Dimilin® data includes Dimilin 25W from 2,058 blocks.

For purposes of this summary, only the Dipel 8L and the Dimilin 25W blocks are used. Because of the survey nature of TMDB, only large sample sizes (more than 30 blocks), and preferably from different projects, are considered for summarization. The primary focus of the analysis then, is upon patterns reflected by summarizing large sets of data.

RESULTS AND DISCUSSION

Analysis in this report is based upon 1) population reduction as measured by a comparison of pre-treatment and post-treatment egg mass estimates, 2) project success as measured by egg mass reduction to below a threshold or preventing defoliation above a threshold, and 3) site factors related to achieving success.

Population Reduction

For a comparison of pre- to post-treatment egg mass survey results only those treatment blocks with both pre-treatment and post-treatment egg mass estimates are used. This results in a comparison of 429 blocks; 360 at 16 BIUs and 69 at 20 BIUs per acre (all 20 BIU applications were in the Delaware project) and for Dimilin, 1,739 blocks:

	Average Pre-Treatment Egg Mass/Acre	Average Post-Treatment Egg Mass/Acre	Average Percent Reduction*
All Dipel 8L Blocks	1,611	691	57**
16 BIU Blocks	1,670	756	55
20 BIU Blocks	1,305	352	73
All Dimilin Blocks	2,705	428	84

* Percent Reduction = ((Pre-Treatment - Post-Treatment)/Pre-Treatment)*100.

** Weighted average based upon number of 16 and 20 BIU blocks.

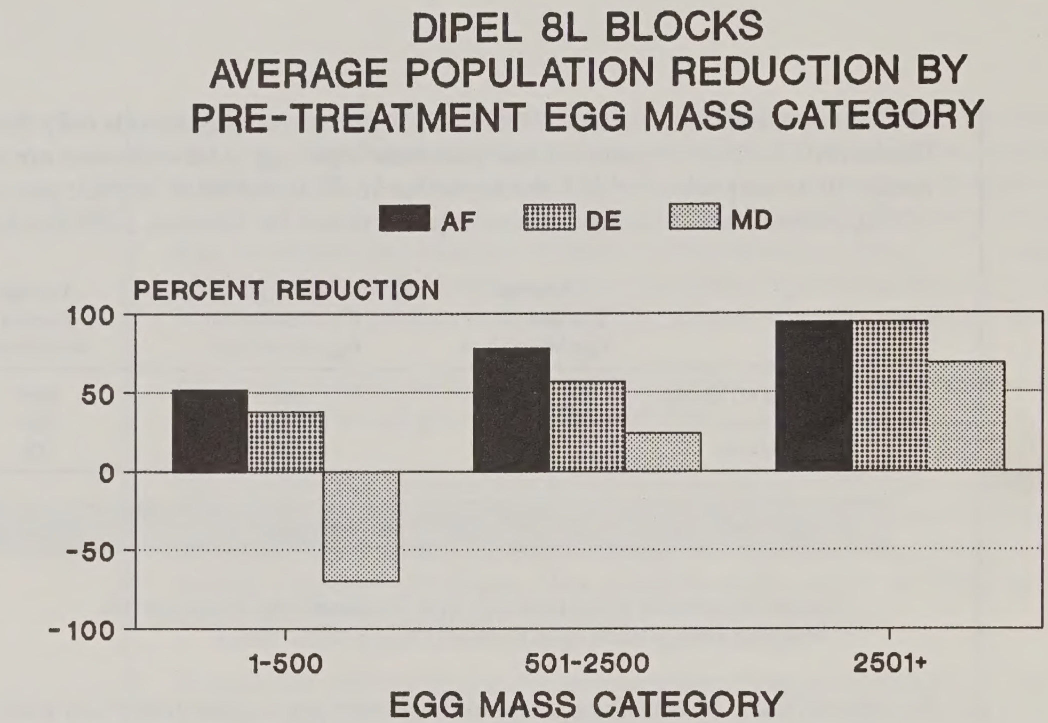
In general, these results show a somewhat better population reduction with 20 BIU Dipel applications than with 16 BIU applications. These results are not entirely comparable since all of the 20 BIU blocks are from one project.

Average population reduction among individual projects is shown below and illustrates the variability among projects in achieving population reduction.

Project	Dimilin	Dipel
	Average Population Reduction Over A 3-Year Period	
Delaware	76%	73%
Maryland	83%	46%
Virginia	82%	-
West Virginia	92%	-
Allegheny National Forest	-	82%
Average	83%	67%

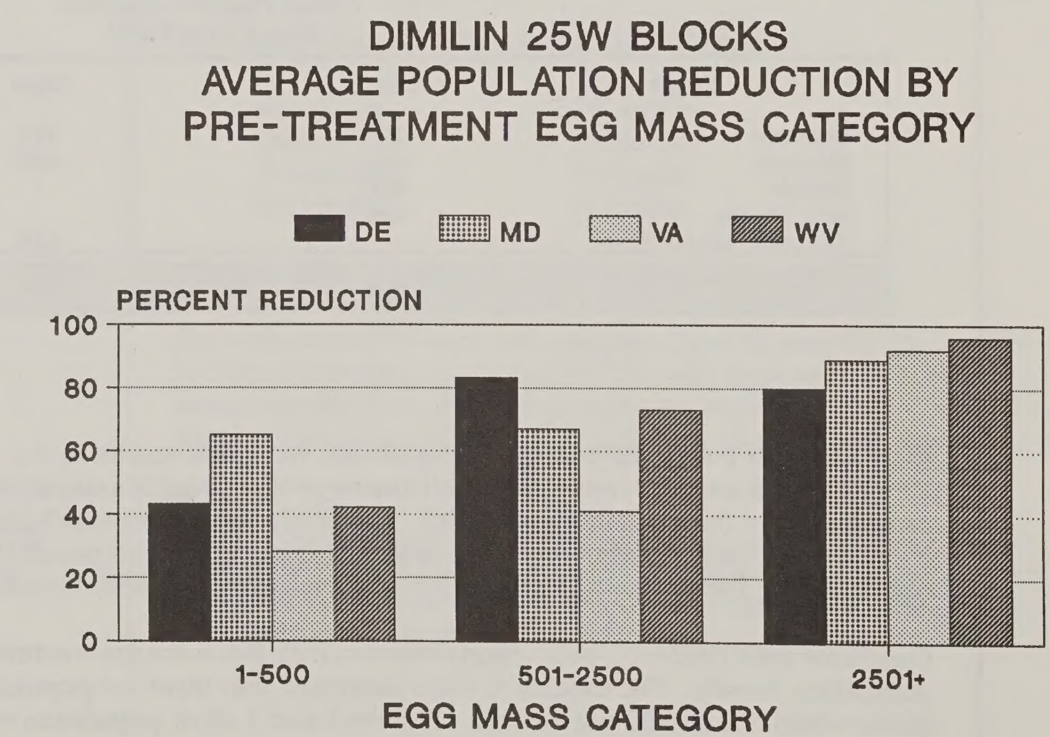
Maryland falls below the average in population reduction results in the use of Dipel. Dimilin results are much more consistent among projects, and this consistency is a factor contributing to the material's popularity. The similarity in Delaware's results for both Dimilin and Dipel is noteworthy. The ability of Dipel to achieve population reduction comparable to Dimilin is also supported by results on the Allegheny National Forest.

One factor associated with population reduction from **B.t.** is the pre-treatment or starting population density. The concern is often expressed that there are population densities above which **B.t.** should not be used. Figures 1 and 2 show population reduction as a function of each project and pre-treatment egg mass category. Two observations can be made from these data:



AF = Allegheny National Forest

Figure 1.



AF = Allegheny Natinal Forest
Note: WV data spans 1987-1989.

Figure 2.

1. The figures, by summarizing pre-treatment egg mass densities into categories, allow a comparison of population reduction effects for similiar pre-treatment densities as follows:

Pre-Treatment Egg-Mass Density	Average Percent Population Reduction	
	Dimilin	Dipel
1-500	45	7
501-2,500	64	55
2,501+	87	75

Why the increasing percent reduction with increasing pre-treatment density? At the lowest category (1-500), a 90 percent reduction from 500 equates with finding only about 1 egg mass per 1/40th-acre survey plot in the post-treatment survey. At these lower egg mass densities, survey mistakes are critical in terms of results. A few egg masses missed during a pre-treatment survey can result in a large miscalculated percent reduction during the post-treatment survey. From the biological standpoint, fewer larvae at these densities means that the insecticide must be effectively distributed throughout the foliage in order to significantly impact the population. In reality, both factors are probably contributing to the observed results. The actual numbers are not as important as the pattern, however. At low, albeit increasing population densites, neither insecticide produced significant population reduction when viewed overall. The average percent population reduction for Dipel is 67 percent. It appears from Figure 1, that the largest contribution to this poor reduction comes from problems at the lower pre-treatment population densities. At the 2,500+ category, both insecticides achieve much greater population reduction, though as it will be shown in project success rates, the 75 percent population reduction of Dipel at the 2,500+ category is often insufficient to result in a successfully treated block.

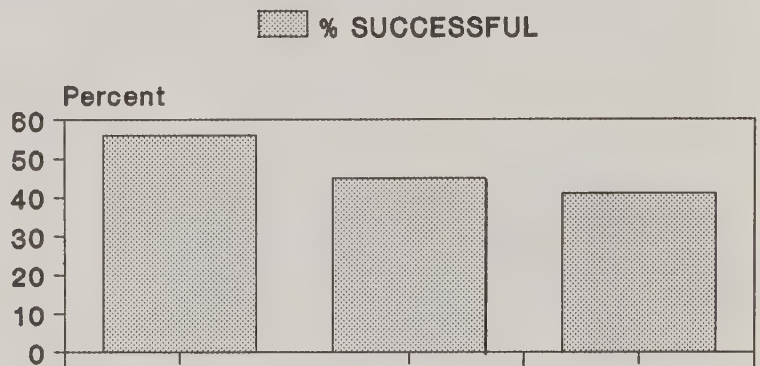
2. The figures also reflect differences among projects in achieving population reduction with each material. Dipel population reduction results in Maryland are consistently below other projects particularly at the 1-500 pre-treatment category. The Allegheny National Forest consistently achieved better population results with Dipel than did other projects. A conclusion here, is that where a material is used may be as important as which material is used. Differences may result from how a project is organized, project logistics and application timing, aircraft calibration and characterization differences, and differences in treatment block sizes.

Project Success

The TMDB introduces the concept of project success for gypsy moth suppression activities. As defined here, project success is either 1) reducing egg mass densities to below a threshold of 500 egg masses/acre, and that this is a reduction of at least 80 percent from the pre-treatment estimate or, 2) preventing defoliation in excess of 30 percent. In some projects, pre- and post-treatment egg mass density estimates were not available. Consequently, an alternative success criteria for these projects was developed that used defoliation instead of egg masses as the variable of interest. In both cases, success rates are determined as the percent of total treatment blocks that meet the criteria for success. In this way, results are expressed as the frequency of meeting some predefined objective.

Figures 3 and 4 show success rates for individual projects.

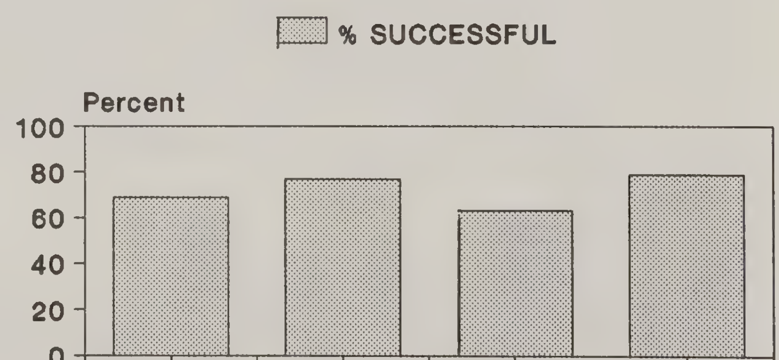
SUCCESSFULLY TREATED DIPEL 8L BLOCKS
EGG MASS COUNTS LESS THAN 500 AND
POPULATION REDUCTION GREATER THAN 80%



	AF	DE	MD
NO. OF SUCCESSES	62	31	100
TOTAL NO. BLKS	111	69	243
% SUCCESSFUL	56	45	41

Figure 3.

SUCCESSFULLY TREATED DIMILIN 25W BLOCKS
EGG MASS COUNTS LESS THAN 500 AND
POPULATION REDUCTION GREATER THAN 80%



	DE	MD	VA	WV
NO. OF SUCCESSES	145	808	133	206
TOTAL NO. BLKS.	211	1056	211	261
% SUCCESSFUL	69	77	63	79

Note: WV data spans 1987-1989.

Figure 4.

Population Reduction Criteria

In Figure 3, across all projects, 47 percent of blocks treated with Dipel were successfully treated as defined by the above egg mass reduction criteria. This is based upon a total sample size of 423 blocks over a 3-year period in 3 project areas.

In Figure 4 across all projects, 72 percent of blocks treated with Dimilin were successfully treated as defined by the above egg mass reduction criteria. This is based upon a total sample size of 1,739 blocks over a 3-year period in 4 project areas.

These results are interesting in that they reflect the rate of achieving a successful outcome for cooperative suppression projects. Population reduction by itself can be misleading unless that reduction is expressed in terms of achieving some predetermined objective. Table 1 compares population reduction and success rates. Projects may achieve relatively high population reduction, yet the reduction may not be enough to result in the block being classified as a success.

Table 1. Comparison of population reduction and success rates for all project in TMDB.

	Dimilin		Dipel	
	Percent Population Reduction	Percent* Success	Percent Population Reduction	Percent* Success
Allegheny National Forest	-	-	82	56
Delaware	76**	69	73	45
Maryland	83	77	46	41
West Virginia	92	79	-	-
Virginia	82	63	-	-

* Percent success is defined as: (number of blocks meeting criteria/total number of blocks)*100.
** Read as Delaware achieved an average 76 percent population reduction, and this resulted in a successfully treated block 69 percent of the time.

Best Results

Combining the results of success rate with population reduction as in Table 1 provides a useful interpretation of both variables. Several conclusions can be drawn from this table:

1. The best results from the use of Dimilin occurred in West Virginia, average population reduction from the use of Dimilin was 92 percent, and 79 percent of blocks could be considered successfully treated. That is, 21 percent of the total blocks still had egg masses per acre in excess of 500, or the percent change from pre- to post-treatment was not greater than 80 percent (for example, pre-treatment of 600 egg masses per acre to post-treatment of 400 egg masses per acre is a reduction of only 33 percent and would be classified as not successful).

2. The best results from the use of Dipel occurred on the Allegheny National Forest, with an 82 percent average population reduction, and 56 percent of the blocks successfully treated.

Ignoring the importance of the specific project, a gross average can be obtained by combining both variables over all projects:

Average Dimilin population reduction is 84 percent, resulting in a successfully treated block 72 percent of the time.

Average Dipel population reduction is 67 percent, resulting in a successfully treated block 47 percent of the time.

Preventing Defoliation Criteria

Treatment monitoring contains limited data for this measure of success. Table 2 shows average post-treatment defoliation for 3 sites for both Dimilin and Dipel. For Pennsylvania, the data illustrates a very high success rate for both Dipel and Dimilin in preventing defoliation. Overall, average success rates for defoliation prevention are:

Dipel = 74 percent of blocks successfully treated
Dimilin = 98 percent of blocks successfully treated

Table 2. Success* rates for defoliation prevention

Project	Total number of blocks treated	Percent of total blocks meeting success criteria
Dimilin 25W		
NF **	2	100
PA **	103	95
Dipel 8L		
AF	114	66
NA **	44	68
NF	6	67
PA	1,480	94

* Success is defined as having defoliation <= 30 percent, and failure is defined as having >= 30 percent defoliation.
** NF is the New Jersey State Forests and Parks; AF is the Allegheny National Forest; and NA is the New Jersey Department of Agriculture suppression projects.

Spray Block Variables Related to Treatment Success

In the following analysis, treatment success is defined as: population reduction to 500 egg masses per acre or less, and this represents a reduction of at least 80 percent from the pre-treatment estimate. Preventing defoliation was not used as a measure of success in this part of the analysis.

Block Size

Table 3 shows average block sizes for both Dimilin and Dipel over 3 years. Block sizes appear to be generally similiar between Dipel and Dimilin, except for West Virginia. Here, block size averages particularly for failed Dimilin blocks tend to be greater than for successfully treated Dimilin blocks.

Differences in block sizes between successfully treated blocks and failed blocks disappear, however, when the West Virginia data is analyzed by year. The results are as follows:

Year	Category	No. of Blocks	West Virginia Average Block Size
1987	Failure	6	2,202
	Success	5	2,458
1988	Failure	23	2,410
	Success	29	2,336
1989	Failure	26	257
	Success	172	231

Note that in this case, year of treatment is more important than block size in determining success.

Larval Development

Average larval development and foliage expansion at the time of treatment are shown in Tables 4 and 5. Weighted averages for all projects are:

	Dipel		Dimilin	
Treatment Outcome	Instar	Percent Foilage Expansion	Instar	Percent Foilage Expansion
Success	2.2	58	1.9	45
Failure	2.0	63	1.7	40

Two observations can be made from these results:

1. Dimilin blocks are generally treated earlier than Dipel blocks. This is particularly evident from the foliage expansion data. The Dimilin block failures also tend to be treated slightly earlier than the Dimilin successes. This may indicate a problem of some blocks being treated too early.

2. Foliage development is advanced in the Dipel block failures. This advanced foliage development may result in insufficient **B.t.** coverage and consequent block failures. It may also be an indication that instar development is further than apparently observed. Treating too late may be a mistake when using Dipel.

Weather Conditions

In general, conditions at the time of treatment for successfully treated Dipel blocks were an average larval development slightly ahead of 2nd instar and 58 percent foliage expansion, and for Dimilin successes, an average larval development slightly before 2nd instar and 45 percent foliage expansion. For the Dimilin applications, it appears important not to make the treatment too early, while for Dipel, it appears important not to make the treatment too late.

Tables 6, 7, and 8 show results of on-site weather monitoring at the time of treatment. These results can be further summarized for all projects using weighted averages as:

	Dipel		Dimilin	
	Success Blocks	Failed Blocks	Success Blocks	Failed Blocks
Relative Humidity (%)	69	68	67	68
Temperature (°F)	65	63	58	59
Windspeed (mph)	2.6	2.5	3.4	2.5

Though no pattern is apparent in these data to distinguish conditions between successfully treated and failed blocks, the general conditions existing for successfully treated Dipel and Dimilin blocks ranged as:

Relative humidity	67-69 percent
Temperature	58-65° F.
Windspeed	2.6-3.4 mph

SUMMARY

The validity of the data is strengthened by large sample sizes and data screening. TMDB represents a level of knowledge existing within the constraints of an operational project. TMDB is a broadly-based survey and results reported here should be viewed in that sense. Nevertheless, the data in TMDB is the best available reflection of gypsy moth suppression projects.

One of the predominant values of TMDB is to establish success rates for gypsy moth suppression. This report documents, for the first time, the results of gypsy moth suppression in terms of meeting some predefined objective. Suppression projects are not in themselves the object of gypsy moth suppression. Rather, some objective such as population reduction, defoliation prevention, or nuisance abatement serves to explain the existence of these projects. It is important then, that the attainment of these objectives be measured.

Attainment is documented here as:

72 percent of Dimilin blocks successfully treated, and 47 percent of Dipel blocks successfully treated when population reduction is used as the criterion.

When defoliation prevention is the criterion:

98 percent of Dimilin blocks, and 74 percent of Dipel blocks were successfully treated.

These results indicate better attainment of defoliation objectives than population reduction objectives. Considering that most gypsy moth projects list population reduction as an objective, some improvement in program effectiveness is warranted, particularly with B.t. And, as shown, much of this improvement is needed in the lower population density blocks.

A successfully treated block can be viewed as the product of suppression efforts. TMDB serves then, as a quality control measure, not only in evaluating attainment of the product, but also in helping to determine necessary improvements. It is also through this effort that project accountability can be established. This accountability can be used to set goals specifically designed to improve project results.

A second value of TMDB is in its recordkeeping. TMDB demonstrates the inherent value of learning by experience. Data collected during the course of a project can be used to evaluate the project's outcome. Patterns related to block success or failure can be used to implement operational changes. This is important within a project where, for example, county-by-county patterns associated with block failure may be used to implement improvement. It is also important for an administrative agency, such as the Forest Service, to evaluate patterns associated with treatment success or failure and then to use these patterns to direct research, provide training, or provide technical assistance.

Overall, it is not the data base created in TMDB that is so important rather it is the process initiated by TMDB that contributes to program evaluation and program improvement.

TABLE 3

AVERAGE BLOCK SIZE
DIPEL 8L BLOCKS

STATE	N	ACRES	
AF	49	704	
DE	38	321	
MD	152	196	FAILURES
MI	2	48	
RI	1	80	
AF	62	380	
DE	31	358	
GB	1	640	SUCCESSES
MD	105	205	
MI	1	205	
RI	3	237	

SUCCESS= (500 EM/AC AND POP RED)= 80%

AVERAGE BLOCK SIZE
DIMILIN 25W BLOCKS

STATE	N	ACRES	
DE	66	273	
MD	257	215	FAILURES
VA	78	468	
WV	55	1369	
DE	144	258	
MD	815	280	SUCCESSES
VA	133	388	
WV	205	584	

SUCCESS= (500 EM/AC AND POP RED)= 80%

TABLE 4

AVERAGE LARVAL DEVELOPMENT
DIPEL 8L BLOCKS

STATE	N	STAGE	
AF	33	1.9	
DE	21	1.8	
MD	107	2.2	FAILURES
MI	1	2.0	
RI	1	3.0	
AF	43	1.7	
DE	12	1.6	
GB	1	1.0	SUCCESSES
MD	83	2.6	
MI	1	2.0	
RI	3	2.7	

SUCCESS= (500 EM/AC AND POP RED)= 80%

AVERAGE LARVAL DEVELOPMENT
DIMILIN 25W BLOCKS

STATE	N	STAGE	
DE	30	1.0	
MD	196	1.9	FAILURES
VA	44	1.8	
WV	54	1.6	
DE	102	1.0	
MD	477	2.2	SUCCESSES
VA	105	1.5	
WV	205	1.8	

SUCCESS= (500 EM/AC AND POP RED)= 80%

TABLE 5

AVERAGE PERCENT FOLIAGE EXPANSION
DIPEL 8L BLOCKS

STATE	N	EXPAN.	
AF	33	59	
DE	21	51	
MD	107	67	FAILURES
MI	1	80	
RI	1	60	
AF	43	51	
DE	12	52	
GB	1	50	SUCCESSES
MD	83	62	
MI	1	80	
RI	3	82	

SUCCESS= (500 EM/AC AND POP RED)= 80%.

AVERAGE PERCENT FOLIAGE EXPANSION
DIMILIN 25W BLOCKS

STATE	N	EXPAN.	
DE	30	20	
MD	196	49	
VA	44	15	FAILURES
WV	54	38	
DE	102	23	
MD	477	58	SUCCESSES
VA	105	21	
WV	205	39	

SUCCESS= (500 EM/AC AND POP RED)= 80%.

TABLE 6

AVERAGE PERCENT RELATIVE HUMIDITY
DIPEL 8L BLOCKS

STATE	N	HUMID	
AF	33	74	
DE	21	70	
MD	107	69	FAILURES
MI	1	75	
RI	1	52	
AF	43	65	
DE	12	74	
GB	1	46	SUCCESSES
MD	83	70	
MI	1	70	
RI	3	67	

SUCCESS= (500 EM/AC AND POP RED)= 80%.

AVERAGE PERCENT RELATIVE HUMIDITY
DIMILIN 25W BLOCKS

STATE	N	HUMID	
DE	30	77	
MD	196	69	
VA	44	61	FAILURES
WV	54	63	
DE	102	68	
MD	477	70	SUCCESSES
VA	105	64	
WV	205	69	

SUCCESS= (500 EM/AC AND POP RED)= 80%.

TABLE 7

AVERAGE TEMPERATURE, DEG. F.
DIPEL 8L BLOCKS

STATE	N	TEMP.	
AF	33	63	
DE	21	56	
MD	122	64	FAILURES
MI	1	61	
RI	1	66	
AF	43	66	
DE	12	56	
GB	1	50	SUCCESSES
MD	92	66	
MI	1	62	
RI	3	73	

SUCCESS= (500 EM/AC AND POP RED)= 80%.

AVERAGE TEMPERATURE, DEG. F.
DIMILIN 25W BLOCKS

STATE	N	TEMP.	
DE	30	49	
MD	196	57	FAILURES
VA	44	63	
WV	54	62	
DE	102	53	
MD	477	60	SUCCESSES
VA	105	61	
WV	205	63	

SUCCESS= (500 EM/AC AND POP RED)= 80%.

TABLE 8

AVERAGE WIND SPEED
DIPEL 8L BLOCKS

STATE	N	SPEED	
AF	33	1.0	
DE	21	2.6	
MD	107	2.9	FAILURES
MI	1	6.0	
RI	1	2.0	
AF	43	2.0	
DE	12	4.1	
GB	1	2.0	SUCCESSES
MD	92	2.7	
MI	1	4.0	
RI	3	5.7	

SUCCESS=LT 500 EM/AC AND POP RED)= 80%.

AVERAGE WIND SPEED
DIMILIN 25W BLOCKS

STATE	N	SPEED	
DE	30	3.8	
MD	196	3.0	FAILURES
VA	44	3.5	
WV	54	2.7	
DE	102	3.9	
MD	477	3.5	SUCCESSES
VA	105	2.8	
WV	205	2.5	

SUCCESS=LT 500 EM/AC AND POP RED)= 80%.

APPENDIX

TREATMENT MONITORING DATABASE DATA FORM

BLOCK INFORMATION

1. STATE: _ _ _   2. COUNTY NAME: _ _ _ _ _   3. BLOCK NAME: _ _ _ _ _

4. BLOCK ACRES (99999 IF UNKNOWN): _ _ _ _ _

5. WAS THE BLOCK PREVIOUSLY TREATED? ☐ YES ☐ NO ☐ UNKNOWN

6. IF BLOCK WAS PREVIOUSLY TREATED, NAME OF INSECTICIDE:
   (EX. DIPEL 8L, THURICIDE 64LV) _ _ _ _ _ _ _ _ _ _ _ _ _ _ _

7. RATE OF PREVIOUS APPLICATION IN OUNCES/ACRE:
   ☐ 128 ☐ 96 ☐ OTHER _ _

8. BIU/ACRE: ☐ 16 ☐ 20 ☐ 0.25 OTHER _ _

9. ACTIVE INGREDIENT/ACRE IN LBS. : _ . _ _
   (EX. 1.00 = 1 LB/AC OR 9.99 FOR UNKNOWN)

PRE-TREATMENT INFORMATION

10. EGG MASS DENSITY PER ACRE PRIOR TO TREATMENT: _ _ _ _ _
    (FALL OF PREVIOUS YEAR OR SPRING OF CURRENT YEAR, 99999 IF UNKNOWN)

11. SURVEY TYPE ☐ 5-MINUTE WALK ☐ FIXED ☐ FV ☐ OTHER

12. AVERAGE EGG MASS SIZE: ☐ NICKEL ☐ DIME ☐ QUARTER

13. NUMBER OF PLOTS/WALKS WITHIN BLOCK: _ _ _

14. IF 5-MINUTE WALK, INDICATE EQUATION (EGGEN) USED:
    ☐ 1 ☐ 2 ☐ 3 ☐ 4 ☐ OTHER

15. EGG MASS VIABILITY (% VIABLE PER MASS, 999 IF UNKNOWN): _ _ _

TMDB-1

BLOCK NUMBER: _ _ _ _ _ COUNTY NAME: _ _ _ _ _ AIRCRAFT TAIL #: N _ _ _ _ _

ON-SITE MONITORING - CURRENT TREATMENT

16. MATERIAL BEING APPLIED IN CURRENT YEAR: _ _ _ _ _ _ _ _ _ _ _
EXAMPLE: DIPEL 8L

17. BIU/ACRE OR ACTIVE INGREDIENT: ☐ 16 ☐ 20 ☐ 0.25 OTHER _ _

18. RATE OF APPLICATION IN OUNCES/ACRE: ☐ 128 ☐ 96 OTHER _ _

19. DATE APPLICATION STARTS: _ _/_ _/90

20. DATE APPLICATION ENDS: _ _/_ _/90

21. MOST OF THE APPLICATION OCCURRED DURING: CHECK ONE OF THE FOLLOWING CODES:
☐ DAYBREAK TO 8:00 AM ☐ 5:01 PM TO SUNSET
☐ 8:01 AM TO 12:00 NOON ☐ ALL DAY (ALL 4 ABOVE)
☐ 12:01 PM TO 5:00 PM

22. PERCENT DEFOLIATION ON TARGET SPECIES AT TIME OF APPLICATION (999 IF UNKNOWN): _ _ _ %

23. FOLIAGE EXPANSION (999 IF UNKNOWN): _ _ _ %

24. FOLIAGE CONDITION: ☐ WET ☐ DRY ☐ UNKNOWN

25. MOST OF THE LARVAE ARE INSTAR: ☐ 1 ☐ 2 ☐ 3 ☐ 4
☐ 5 ☐ 6 ☐ UNKNOWN

26. LARVAL INSTAR DETERMINED BY:
☐ CLOSE INSPECTION OF 5 OR MORE LARVAE
☐ GROUND OBSERVATION OR INSPECTION OF LESS THAN 5 LARVAE

27. WIND SPEED, MPH (99 IF UNKNOWN): _ _

28. WIND SPEED MEASURED IN BLOCK: ☐ Y ☐ N ☐ U

29. TEMPERATURE DEGREES F (999 IF UNKNOWN): _ _ _

30. TEMPERATURE MEASURED IN BLOCK: ☐ Y ☐ N ☐ U

31. RELATIVE HUMIDITY (999 IF UNKNOWN): _ _ _

32. RELATIVE HUMIDITY MEASURED IN BLOCK: ☐ Y ☐ N ☐ U

33. SPRAY DEPOSIT IN THE BLOCK IS OBSERVED TO BE: ☐ GOOD
☐ POOR
☐ UNKNOWN

AIRCRAFT CALIBRATION DATA

NOTE: COMPLETE ONLY ONE FORM FOR EACH AIRCRAFT USED, EXCEPT WHEN THE SAME TAIL NUMBER IS USED TO SPRAY MORE THAN ONE FORMULATION, PLEASE FILL OUT A SEPARATE DATA ENTRY FORM FOR EACH FORMULATION

34. AIRCRAFT TYPE (EX. TURBO THRUSH): _ _ _ _ _ _ _ _ _ _ _ _ _ _
    FORMULATION USED (EX. DIMILIN 25W) _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _
35. TAIL NUMBER (EX. N1002C): N _ _ _ _ _ _
36. CARRYING CAPACITY AS USED: _ _ _ _ GALLONS
37. ON BOARD AGITATION: Y N U
38. TOTAL BOOM LENGTH (ROUND OFF): _ _ _ _ FEET
39. NOZZLE TYPE: FLAT FAN MICRONAIR BECOMIST
40. NOZZLE TIP SIZE/MODEL: 8003 8004 8005 OTHER _ _ _ _
    AU4000 AU5000 8020
41. SCREEN MESH (999 IF UNKNOWN): _ _ _
42. TOTAL NUMBER OF NOZZLES (999 IF UNKNOWN): _ _ _
43. NUMBER OF NOZZLES LEFT OF CENTER (999 IF UNKNOWN): _ _ _
44. FOR FIXED WING AIRCRAFT,
    INDICATE DISTANCE FROM WING TIP TO OUTER MOST NOZZLE:
    _ _ INCHES BEYOND TIP _ _ INCHES BEFORE TIP _ _ 99 IF AT TIP
45. NOZZLE ANGLE, 45 IS FORWARD, 90 IS STRAIGHT DOWN: _ _
46. OPERATING PRESSURE (999 IF UNKNOWN): _ _ _ PSI
47. CALIBRATED FLOW RATE (999.9 IF UNKNOWN): _ _ _._ GAL/MIN
48. ESTIMATED AIRCRAFT SPEED DURING APPLICATION (999 IF UNKNOWN):_ _ _ MPH
49. SWATH CHECKED OVER CARDS: Y N U
50. ASSIGNED EFFECTIVE SWATH WIDTH (999 IF UNKNOWN): _ _ _ FEET
51. ESTIMATED DROPLET SIZE (999 IF UNKNOWN): _ _ _ VMD
52. ESTIMATED MINIMUM DROPLET DENSITY (999 IF UNKNOWN): _ _ _
53. AVERAGE PRODUCTION PER HOUR: _ _ _ _ _ ACRES/HOUR

BLOCK NUMBER: _ _ _ _ _ COUNTY NAME: _ _ _ _ _

POST - TREATMENT DATA

NOTE: ONLY 1 TYPE OF POST-TREATMENT MONITORING (DEFOLIATION, OR EGG MASS COUNT) IS REQUIRED.

DEFOLIATION

54. AVERAGE PERCENT OF DEFOLIATION OF TREES IN BLOCK ON TARGET SPECIES (999 IF UNKNOWN): _ _ _ %

55. PERCENT OF BLOCK DEFOLIATED (999 IF UNKNOWN): _ _ _ %

56. SURVEY TYPE: ☐AERIAL ☐GROUND ☐PHOTO

EGG MASS COUNT

57. POST-TREATMENT EGG MASS DENSITY (99999 IF UNKNOWN): _ _ _ _ _ EM/AC

58. AVERAGE EGG MASS SIZE: ☐ DIME ☐ NICKEL ☐ QUARTER

59. SURVEY TYPE: ☐ 5-MINUTE WALK ☐ FIXED ☐ FV ☐ OTHER

60. IF 5-MINUTE WALK IN 60, INDICATE EQUATION (EGGEN) USED:
    ☐1 ☐2 ☐3 ☐4 ☐OTHER

61. NUMBER OF PLOTS/WALKS WITHIN BLOCK: _ _